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Wagner, Michael

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WAGE STRUCTURES IN MANUFACTURING INDUSTRY AND IN
PUBLIC ADMINISTRATION; AUSTRIA 1868-1885

Michael Wagner⁺

The paper primarily reports on inequality of pay on the micro- and the macro-level of the manufacturing sector in Vienna and Lower Austria at the high tide of industrialization. It arrives at the following conclusions:

- The size distribution of wages paid by factories was virtually the same as that of wages paid by crafts-shop.
- The size distributions of male and of female wages respectively did hardly overlap but the degree of inequality was the same within each sex group.
- The degree of inequality significantly varied between different manufacturing industries.

I. INTRODUCTION: HETEROGENEITY AND INEQUALITY

Industrialization caused a far reaching redivision of labour in the Austrian manufacturing sector during the 19th Century. Contemporaries invariably linked these forms of production to a specific institution: "the factory-system". The factory differed from the traditional crafts-shops in technical equipment as well as in social organization. In both areas factories applied a great variety of methods of setting up and controlling production.

Regarding social organization, factory management constantly faced the problem to ensure the provision of labour services (in an adequate skillmix) required for a smoothly running production at the target level of output. This was by no means an easy task; it involved recruiting new personnel to cover turnover losses at all skill levels, inducing experienced workers to cooperate in training new recruits, encouraging careful and efficient handling of costly machinery, and eliciting substantial (physical and mental) effort on part of the workforce. By the time of the pre 1873 boom, the first high tide of industrialization, Austrian entrepreneurs mainly relied on one instrument to achieve these tasks: pay.(1)

But in order to become a powerful instrument, pay had to be used with discrimination, since, in general, the workforce even of a single factory was socially extremely heterogeneous. This entailed that no simple relationship existed between the average level of wages paid by an entrepreneur and the quality of labour services

⁺ Address all communications to: Institute for Advanced Studies (Vienna), and Federal Academy of Public Administration (Vienna).
Verwaltungsakademie des Bundes, Mauerbachstraße 43, A 1140 Wien

he got in return. Thus, in order to keep labour costs down, entrepreneurs had to implement highly differentiated pay scales. Their structure varied not only between different industries but as well between factories producing the same type of output.(2)

This variation in pay for similar jobs persisted because competition on labour, capital, and output markets was frequently of a very imperfect kind. Uneven spread of information, restricted labour mobility, and the great variety of capital equipment contemporaneously used in an industry led to monopolistic competition on labour markets. Thus, entrepreneurs fixed their wage offers rather than accepting "the" market rate. The latter would anyway have been a difficult task, given the heterogeneity of labour supply. "The" market for a specified quality of labour services just did not exist; every entrepreneur had to make his own market. This left him with a substantial margin for his wage offers. At which level, in the end, an entrepreneur set his wage offers for particular job openings depended on the internal structure of his factory: Whether the authority of a supervisor was enhanced by putting a sizeable wage differential between him and his subordinates; whether a cut in piece rates increased capital utilization (because of a forward bending labour supply curve); whether a rise of the average wage level reduced costs of labour turnover.(3)

Thus a firm's pay scale reflected how the socio-technical system of the factory worked within its social and economic environment. The interaction between the internal structure and the external environment did not follow, however, a fixed pattern. In a "company-village" in Lower Austria, the factory shaped its own environment to a great extent, whereas in Vienna a single firm's organization of work caused little repercussions.(4)

Though it is extremely difficult to judge the relative importance of the various factors mentioned for the inequality of pay, a first attempt in this direction can be made by discussing the dispersion of wages:

- at different levels of aggregation (single factory - various industries - whole manufacturing sector);
- for different sizes of production units (factories vs crafts-shops);
- for different "production technologies" and types of "output" (High vs low skill technologies; "production" vs "administration");
- for different characteristics of the workforce (sex efficiency levels).

Following the lead of Professor Fischer's seminal paper on the status of factory workers, I start at the micro level of the individual firm: A description of detailed wage structures of single factories (and other units of employment quite different from production in manufacturing) might provide interesting material pertinent to a question that has attracted (apart from the economic dynamics of industrialization) the interest of historians: the mechanisms of social stratification in an evolving industrial society.(5)

II. THE MICRO-LEVEL

Before discussing in greater detail a sample of payscales, their common features and quantitative dimensions, it might be useful to comment in general on the significance of money wages in the Austrian economy of the late 1860s. A substantial share of the workforce (even outside the agricultural sector) got only part of its total compensation in money wages: They were supplemented by payment in kind. This was certainly true within the crafts-shop sector for all levels of skill. Even if a journeyman did not live in his master's household, he frequently joined common meals; but often the traditional unity of household and workshop continued anyway in the craftsshop sector through the 1870s. If tradition still played an important role among craftsshop workers of the manufacturing sector (and there are several indications for this assumption) then money wages, levels and differentials, were rather rigid; at least more sticky than compensation in kind. For the rigidity of money wages was for centuries a well established property of skilled labour markets controlled by crafts-corporations. The allocation of labour was not governed by wage competition of master craftsmen, but by intricate mechanisms of queueing and quantity rationing. Money wages for skilled workers indicated their position in the corporate society of early capitalism, rather than a particular economic standard of living.(6)

This cannot be said of the wages paid to unskilled factory labourers. Since most of them were drawn from the bottom ranks of society, they did not have any status to be expressed in terms of money wages. But they badly needed money income to supplement their means of subsistence derived from seasonal (or even only casual) labour, particularly in agriculture. Thus, in the early decades of the 19th Century the economics of the factory money wages was one of supply determined by the marginal cost of subsistence and demand governed by output. As industrialization spread, however, factories could no longer primarily rely on the coercive methods of the early days; pay as an incentive for increased effort and regular working habits (rather than just a means of keeping the workforce literally alive) gained in importance. Hence, even for unskilled workers, wages did not primarily serve as market clearing "prices" on the labour market.(7)

This is as well quite obvious for the third type of pay to be considered: wages and salaries of public employees. Public pay scales reflected the assignment of status even to a greater degree than the money wages of journeymen did. For the public authorities had a corporate conception of public employment; it was to mean more than just being on the public payroll: Lifelong commitment, and strict observance (in and out of work) of the rules laid down by the superiors. In turn even the worker at the bottom of the wage hierarchy could expect promotion, modest as it might have been, during his lifetime. Thus pay differentials were not only static indicators of rank, but a constant promise to the diligent and loyal employee how years of effort would be rewarded in the future.

A comparison of factory wage structures with public pay scales might serve several purposes: it mirrors social stratification in terms of money wages; it helps to identify how differences in the type of labour services affected inequality of pay in the respective institutions; and it is a useful anticipation of the development of work organization that was to come in later stages of industrialization, when clerical and administrative work grew in importance. For the public bureaucracy was as much a model of modern white collar work, as the rules of proper conduct among corporate journeymen were for the skilled labour force of the 1870s.(8)

1. A sample of industrial wage structures

The following pay scales are drawn from the data of the 1868 industrial census for Vienna and Lower Austria; they have been selected as representative specimen:(9)

- of an "old" industry (textiles) employing predominantly unskilled labour (a large proportion of which was female) at a comparatively low average wage level;
- of a "new" capital goods industry (mechanical engineering) employing a predominantly male work force of highly differentiated skill groups at an average wage level;
- of an industry (cartridge cases) that was not subject to pronounced fluctuations in demand and employed a work force within a medium proportion of skilled to unskilled labour;
- of a "new" consumption goods industry (metal furniture) with an exceptionally high ratio of skilled labour.(10)

The substantial inequality of pay in the Austrian manufacturing sector is well illustrated by the first example, the wage scale, of a large factory of spinning and dyeing of worsted yarn (Table 1). It employed about 604 workers which were classified into four groups (male and female, adult and younger than 17 and who were assigned to 10 types of jobs. For male adults the minimal wage rates covered a range of about 1:3 (the same holds true for the maximal rates which were generally 20 % above the minimum); for female adults the range was 1:2. The pay scale for the obviously highly skilled workers in the maintenance and repair department started at the maximum rates for spinners.(11)

The second example is the pay scale of the largest Viennese manufacturer in mechanical engineering (Table 2). He classified his work force into 12 groups. All jobs that required a journeyman's training (or its equivalent) were paid at least the average wage of the factory (though carpenters just got the average rate). Labourers paid by the day, the lowest rank, earned nearly two thirds of the average.(12)

Though the absolute level of pay was much higher in mechanical engineering, the spread of wage differentials ranged further in the textile mill. In both cases there is a remarkable difference between skilled and unskilled workers.

Another feature of industrial pay scales is clearly reflected by the wage structure of a factory producing cartridge cases (Table 3).

Its work force of 40 persons comprised 12 highly qualified workers (master-craftsmen or journeymen) and 28 unskilled labourers (mostly female or younger than 17 years old). The unskilled labourers uniformly earned 5 to 6 fl a week; the pay scale for the highly qualified workers, however, indicated a distinct ranking. Toolmakers and other operators of machine tools (who had to perform tasks involving close tolerances) received top wages. Then followed locksmiths who in turn were graded above blacksmiths. These three ranks received as weekly wages: 18 fl, 15 fl, and 13 fl. Thus the differential between blacksmiths and machine tool operators was as large as the one between unskilled labourers and blacksmiths. (13)

Frequently the ranking of skilled labour was reflected in the maximum pay that workers could earn under a piece rate system. A Viennese manufacturer producing metal furniture (Table 4) employed 222 workers of which 185 possessed skills of traditional trades. Two engravers received the top pay (18 - 32 fl a week) then followed 90 blacksmiths, 62 girdlers and varnishers, 23 patternmakers and carpenters, and machine operators. Each of these groups made at least 10 fl a week, but blacksmiths could earn as much as 22 fl, girdlers and varnishers 15 fl, patternmakers and carpenters 12 fl, whereas machine operators received a fixed wage rate of 10 fl; which was the upper bound for the 27 unskilled labourers, who made at least 7 fl a week; ten apprentices received 4 - 6 fl. (14)

These four wage scales nearly covered the whole range of pay in the manufacturing sector of this period. They show that in terms of pay, skilled and unskilled, male and female workers belonged to hardly overlapping layers of the workforce. But within each group, there still was room for substantial inequality of pay. Thus the single factory was a sharply stratified social microcosmos, in which only the best skilled male workers earned enough to keep in the long run above the subsistence level. (15)

At the same time the Viennese municipality paid even its least skilled workers a wage above the subsistence level. This highlights the difference in social setting between factory work and employment on the public pay roll.

2. The pay scale of the municipality of Vienna

In 1883, blue and white collar workers contributed roughly equal shares to the municipal workforce. Both groups considered, in general, their employment relation as long term. Thus the pay scale provided for promotion by seniority. At the top, employees stood the chance to quadruple pay during their service with the municipality. And even members of the firebrigade, at the bottom of the wage hierarchy, could double wages (if they survived the hazards of their occupation). (16)

Each department had its own hierarchy and ladders of promotion. The pay office's pay scale, e.g. (depicted in Chart 3) started at the bottom with less than 17 fl weekly pay and went up as high as 77 fl for the director. The wage distribution of the pay office reached its mode at 22 fl; this was the final step in the career of Tax-kommissär but the starting salary for Kassaoffiziale. (17)

Regular promotion as an incentive for effort and loyalty was a crucial factor in designing pay scales for most groups of employees: The higher the chances for promotion, the steeper the gradient of the wage hierarchy. This is well illustrated by the wage structure of law school graduates employed by the municipality (Chart 3). The distribution of wages up to about an income of 58 fl primarily reflects the employees' age structure and the department's promotion patterns.

A comparison of factory pay scales with the municipal wage structure lends support to the following observations:(18)

- The bureaucratic administration of clerical work favoured "internal" (organizational) considerations in determining pay levels and differentials, because the internal labour market was as important as the external one.(19)
- For both groups, pay scales were more differentiated at the top than at the bottom (e.g. the top administrative job earned its incumbent more than three times as much as the 9th decile of the municipal wage distribution).(20)

There was however nearly as much inequality among factory workers as there was among public employees (compare the Lorenzcurves in Chart 4).

The sources of wage dispersion on the macro-level are discussed in the next section of the paper. The data are drawn from the 1885 census on industrial production in Vienna and Lower Austria.

III. THE MACRO-LEVEL

In 1885 the dispersion of wages significantly varied with the characteristics of both, the workers and the firms. On part of the workforce, sex and the levels of efficiency influenced the inequality of pay; on part of the firms, the industry in which the employer operated played an important role in shaping the size distribution of wages. In general, it is safe to say that the dispersion of wages in the manufacturing sector was greater in 1885 than it is today.(21)

1. Sex differentials

That employers used strategies typical of monopolistic competition might serve us well as working hypothesis for explaining observed sex differentials in wages: Factories treated men and women as non-competing groups by classifying jobs as typical "male" and "female". "Female" jobs could be paid less, because women would generally accept wages significantly below that level which contemporaries considered the minimum for physical survival. This was not the case for men who had to depend on their factory wages.(22)

Though men and women were usually not competing for the same jobs, employers tried to redesign their production in a way that substituted male by female jobs. It is interesting to note that with-in the increasing number of female jobs the same hierarchical pattern of wage dispersion emerged as could be observed among male jobs. The income shares of the ranked 10 % groups of workers were equal for men and women. For both sexes the top group earned six times as much as the bottom group (Table 8 and Chart 1). (23)

If the "wage-setting" - "non-competing groups" - hypothesis is correct, then women were drawn into industrial production by the redesign of its job-structure. Thus female participation rates in the various industries should be explained by the distribution of wage offers (and not vice versa). Quantitative evidence on this question is ambiguous, however:

- the share of female workers employed in each of the 12 industries (in 1885) can be explained (to some extent) by the average level of pay in each industry; (24)
- however, the change of female participation rates in each industry from 1875 to 1885 can not be explained by average wage levels. (25)

Labour market segmentation by sex was by no means restricted to factory jobs. Female crafts-shop workers got to the same extent assigned to low-pay jobs; this sex bias even dominated the efficiency factor: The average wage of "efficient" male workers (7,3 fl) was about two thirds higher than that of "very efficient" female labourers (5,2 fl). The first decile of "inefficient" men was still above the 6th decile of "very efficient" women. (26)

In terms of a decomposition of the Theil-coefficient, the only population decomposable inequality measure, differences between male and female workers explain 29 % (factories) and 58 % craftshops of the overall inequality of wages among the respective workforce. (27)

2. Efficiency differentials

The efficiency variable (to which I referred above in the discussion of sex differentials) is based on a distinction made by the 1885 survey. All employees of crafts-shops were classified into three groups depending on their level of efficiency (as judged by the master craftsman who ran the shop).

Average efficiency differentials were sizeable: "inefficient workers" earned 40 % and "workers of average efficiency" nearly 20 % less than "very efficient workers" (Table 7).

However, even more remarkable is the dispersion of wages within each efficiency group. The degree of inequality, as measured by the Theil-coefficient, was for "low efficiency": 0,103; for "average efficiency": 0,092; for "high efficiency": 0,116; for all crafts-shop workers: 0,122. Thus only about 13 % of the observed total inequality was due to intergroup differences. (28)

Even if we account for the obvious problem that not all master craftsmen might have used identical criteria for labelling their employees,

the large dispersion of wages within each efficiency group deserves a few comments: the observed variance in earnings could have been caused by differences in weekly output. If workers were tied to a piece rate system, but were not free to choose output, then their wages depended on the demand for the firm's output. Fluctuations in demand are, however, only a special case of a more general observation: Under the regime of monopolistic competition on labour markets, an entrepreneur determined his wage offer for a specific job in relation to the expected productivity of a labourer on this job. If workers from one of the efficiency groups were eligible for a set of jobs which covered a whole range of expected labour productivity, then substantial wage dispersion was to be expected. The piece-rate system served under such circumstances mainly as a device of shifting the risk of output fluctuations from the employer to the worker. (29)

Wherever the causes of wage dispersion are located, the significant variance of wages (within an efficiency group) must have encouraged search for better employment opportunities. This may be part of the explanation of the relative high labour turnover. Moreover, if workers did quit before they had found a new job, then they ran the risk of ending up with less pay than in their previous job. Thus it is very likely that individual workers experienced substantial income instability independent of general labour market conditions. (30)

Since "efficiency" could have been a feature of a specific job (as opposed to a personal trait of workers) it might be that the degree of inequality of pay can be explained by certain characteristics of the industry in which the labourers worked. The next section is devoted to a discussion of this question.

3. Differences between industries

The differences between pay scales (as documented in Tables 1-4) of firms belonging to different industries seem to indicate that there was a close and systematic relationship between the type of output, the production technology, and the dispersion of wages in an industry. Thus we would expect that industrialization, by inducing structural change in the manufacturing sector, had a strong impact on the overall degree of inequality of pay among workers in this sector.

This conclusion, however, is not borne out by an analysis of the 1885 census data. Though the Gini-coefficients of the 12 industries indicate substantial differences in the size distribution of wages, it seems difficult to discern a common factor that would account for the variance in wage dispersion: This impression was confirmed by an attempt to run "inequality of pay" - equations for the two digit level industrial classification. Neither variables for the degree of mechanization, for capital intensity, for the size distribution of firms, nor past rates of sectoral growth, the share of female workers, or labour productivity could explain the variance in wage inequality (regardless of whether it was measured by Gini- or Theil-coefficients). (31)

Hence, structural change in manufacturing caused by industrialization probably had very little effect on the size distribution of manufacturing wages in Vienna and Lower Austria. For, in terms of a decom-

position of the Theil-coefficient, the differences between industries contributed only about 16 % to overall wage inequality; nearly 84 % of the Theil-coefficient is attributable to intra-industrial inequality alone. (32)

With respect to the size distribution of wages there was not much difference between (large scale) factories and (small scale) crafts-shops either (Table.6). Factory wages averaged 7,9 fl compared to 8,6 fl for crafts-shops; the Gini-coefficients were 0,285 and 0,281 respectively. (33)

IV. CONCLUDING REMARKS

Any attempt to draw conclusions about the dynamics of historical change in income inequality in Vienna and Lower Austria has to take account of two observations: (34)

- First, the monopolistic nature of labour market competition weakened the links between general supply and demand conditions and relative wage movements. The more "internal" considerations determined the wage setting behavior of employees, the less influence did competitive pressures exert on pay differentials. Thus the change (or persistence) of wage structures has partly to be explained in terms of an internal organizational history of the employing institution. An extreme case in this respect is the municipality of Vienna: The inequality of pay among its employees hardly changed during the 19th Century, even though the workforce considerable increased in numbers and comprised a great variety of occupations. Even if most entrepreneurs were less sheltered from competitive pressures, the history of their employment relations had a strong impact on the development of their pay scales. (35)
- Secondly, the lack of any systematic relationship between technology and inequality of pay in cross section data supports the hypothesis that there was no strict complementarity between technical progress and its translation into a specific social organization of work, e.g. the split of skilled jobs into several tasks, all of which could be carried out by unskilled labour, did not entail a more egalitarian distribution of wages among the workforce. Thus it would be insufficient to explain the long run decrease of pay differentials in manufacturing industry by referring simply either to mechanization or to supply-demand conditions. (36)

To put these observations from Austria into a nutshell: The impact of industrialization on inequality of pay has to be studied in terms of evolutionary competition between different social organizations of work (rather than in terms of "production functions"). From this point of view, "municipal employment" of 1883 seems to have served as a paradigm for the Austrian workforce of today. (37)

APPENDIX

The appendix documents the OLS estimation results for several "inequality of pay" equations. Since this appendix serves to demonstrate the failure of an attempt to explain the degree of inequality with standard economic variables, I always quote the "best" results in terms of t-values and R^2 . Each of the twelve industries was treated as an observation.

List of Variables

THEIL	Theil coefficient
GINI	Gini coefficient
ANTW85	Share of female labour
ARBUNT	Average number of workers per factory
TRARB	Change in employment numbers (1875-1885)
ANSTAR	Proportion of piece rate to time rate contracts
PSUNTE	Average horse power of machinery per factory
PRWAB	Gross output per worker

	Equation No			
	(1)	(2)	(3)	(4)
Explained Variable	GINI	GINI	GINI	THEIL
Explanatory Variables				
ANTW85	-	0.0003 (0.84)	-	0.001 (0.36)
ARBUNT	-	0.0005 (0.95)	-	0.0005 (1.12)
TRARB	-	-	-	-
ANSTAR	-	-	0.007 (0.18)	-
PSUNTE	0.002 (0.30)	-	-	-
PRWAB	-0.0001 (1.11)	-	-	-
Constant	0.019 (14.2)	0.233 (11.0)	0.11 (6.18)	0.91 (4.98)
R^2	0.140	0.214	0.003	0.169

t-values in brackets below coefficients

FOOTNOTES

I am indebted to Peter Tomanek and Karl Pichelmann for their valuable research assistance and to Tony Atkinson, Bill Kennedy, and Sidney Pollard for helpful comments on an earlier draft of the paper.

- 1 Labour turnover was considerably in Vienna (one of the two regional centers of manufacturing in the Habsburg domains in 1868): EHMER 1979. (For detailed figures compare a German example: SCHÄFER 1979). In earlier periods entrepreneurs used coercive methods to keep their workforce in line: OTRUBA 1971. For the general problems created by the new division of labour: DURKHEIM 1893.
- 2 On the heterogeneity of the workforce: MATIS 1966.
- 3 The same considerations enter today's factory management: ROCK ED. 1972; LAWLER 1971; LUPTON 1972.
- 4 On "company villages" in Lower Austria: KNOLZ 1843; further references: MATIS 1966.
- 5 FISCHER 1964; it was this question of social stratification to which Professor Fischer addressed himself (he referred in particular to DAHRENDORF 1956).
- 6 The unity of workshop and household in the Viennese crafts-shop-sector of the 19th Century: EHMER 1980; this unity even occurred in factories of earlier periods: MITTERAUER 1975, p. 65. The balance between payment in kind and money wages in different trades in Vienna during the 18th Century: WAGNER 1980. On the persistence of corporate traditions among the skilled labour force: EHMER 1979. Pre-industrial labour markets for journeymen: HULBER 1975. Time series of stable journeymen wages: PRIBRAM 1938.
- 7 The pauperism-problem connected with factory labour in Vienna and Lower Austria: HÄUSLER 1979, pp. 80 pass. Wage cuts for unskilled labour could cause widespread unrest: HÄUSLER 1979, pp. 80 pass. (On the social origins of workers and the extent of complementary seasonal employment in German manufacturing industries: BORSCHIED 1979, RUPIEPER 1979).
- 8 Max Weber (WEBER 1964, pp. 703 pass.) in particular stressed the importance of the bureaucracy as a paradigm for rational control of large organizations. An explicit reference to the adaption of bureaucratic models in German industry: KOCKA 1978, p. 554.
- 9 In general the 1868 census gives the wage distribution for whole industries (at the 3-digit level), but in several instances pay scales for individual factories are available.
- 10 On the characteristics of the four industries: NIEDERÖSTERREICHISCHE HANDELS- UND GEWERBEKAMMER 1870.
- 11 Similar proportions for male workers' wages in a German (Chemnitz) spinning mill: FISCHER 1964, p. 209.
- 12 Compared to wage scales at A. Krupp of the same time, there was less inequality of pay in the Viennese factory: FISCHER 1961, pp. 211 pass., and PIERENKEMPER 1981.
- 13 Equally high differentials within the group of skilled workers: FISCHER 1961, p. 209.

- 14 The relation of about 1:3 between engravers and unskilled labourers was similar to that in the German textile industry: FISCHER 1961, p. 209.
- 15 Vogelsang estimated in 1880 that the yearly subsistence level for a family of five was 780 fl. (food: 63 %; rent: 20 %; clothing: 10 %): STEKL 1979. More estimates: Table 5.
- 16 The data are drawn from Statistisches Jahrbuch der Stadt Wien 1883, pp. 79-84. A fuller account gives WAGNER 1979.
- 17 See Chart 3.
- 18 A comparison between factories and municipal employment in the 1870s in many respects reads like the one between English and Japanese employment relations: DORE 1973.
- 19 On the important internal functions of predictable income for bureaucratic organizations: WEBER 1964, pp. 203 pass.
- 20 A similar observation for Germany: FISCHER 1964, pp. 209 pass.
- 21 Today the proportion between the average wages of the bottom and the top 10 % of Austrian industrial workers is 1:1.5. For more detailed information: SUPPER 1981.
- 22 If we assume 1 fl a day as lower bound for longterm subsistence of a single worker depending on factory employment (see Table 5), then 90 % of all female, but only 30 % of male workers received wages below the subsistence level (see Table 8).
- 23 The redesign of jobs was usually achieved by splitting up traditional "skilled" tasks into activities carried out by unskilled labourers.
- 24 This result was obtained by an OLS regression of the share of female labour in an industry (ANTW) on the average wage level in the industry (MEAN) and on the growth of employment that occurred in the industry over the decade 1875-1885 (TRARB):

$$\text{ANTW} = 152 - 13.3 \text{ MEAN} - 0.30 \text{ TRARB}$$

$$(3.91) \quad (2.70) \quad (0.70) \quad R^2 = 0.504$$
(The numbers in brackets are t-values).
- 25 The parameters of MEAN and TRARB proved to be insignificant and the R^2 was close to zero in the OLS estimates explaining the change in female participation rates. A different set of other explanatory variables did not improve the results.
- 26 Both groups were of similar size: 23.628 "inefficient" male and 25.622 "very efficient" female workers.
- 27 On the population decomposability of inequality measures: BOURGUIGNON 1979. The Theil-coefficient (T) of a population consisting of z groups $i=1, \dots, z$ can be decomposed in the following way:

$$T = \sum_{i=1}^z Y_i \log \frac{Y_i}{n_i} + \sum_{i=1}^z Y_i T_i$$

where n_i is the share of group i in the total population ($\sum n_i = 1$) and Y_i is the share of group i in the total income ($\sum Y_i = 1$) and T_i is the Theil-coefficient measuring income inequality within group i .

quality within group i. The decomposition results into:

Degree of inequality	Crafts-shops	Factories
- of total population:	0.121	0.037
- within sex groups:	0.051	0.091
- between sex groups:	0.070	0.128

- 28 The decomposition of $T = 0.121$ for crafts-shop workers results in: Inequality "within" efficiency groups: 0.105; differences "between" efficiency groups: 0.016. This wide variation of earnings within occupation and within local labour markets can still be observed today: PHELPS-BROWN 1977, pp. 256 pass.
- 29 For a labour market model with "fixed" productivity levels for each job: THURLOW 1975.
- 30 The observations about high turnover rates for journeymen are supported, for Vienna, by data drawn from the Gesellenvormerkbücher deposited in the Wiener Stadt- und Landesarchiv.
- 31 The explanatory variables were taken from the 1885 census (HANDELS- UND GEWERBEKAMMER 1889; pp. XLIV, LX). (I might add that estimates of "inequality of pay" equations and of simple wage equations (across industries) do not lead to significant results for recent (1976) industry data either. For details see the Appendix.
- 32 The decomposition of the Theil-coefficient: "total" inequality = 0.128; inequality "within" industries = 0.107; differences "between" industries = 0.107.
- 33 The similarity of both size distributions is by no means trivial. Even for a purely statistical reason a more marked difference was to be expected: The upper skill groups of workers were employees (receiving wages and thus entering the statistics) in the factory sector but they were selfemployed (and thus excluded from the wage statistics) in the workshop sector. Hence, an identical workforce would have led to relatively less observed wage inequality within the workshop sector. By the same argument, the average wage should have been higher in the factory sector. Regarding average wage levels, there is, however, a balancing consideration. Apart from discrepancies in regional coverage (factories: Vienna and Lower Austria; crafts-shops: Vienna only), the census might have over-estimated the average level of wages paid by workshops because the non-response-rate was higher among poorly organized (and low paying) master craftsmen.
- 34 Moreover Viennese and Lower Austrian manufacturing in the years 1868 and 1885 were hardly representative for the whole process of industrialization in Austria. - Demographic background: EHMER 1979; the trade cycle positions of both years: KERNBAUER/MÄRZ 1981; the (declining) importance of Vienna and Lower Austria in the Habsburg domains: MATIS/BACHINGER 1973; the standard of living: SANDGRUBER 1980.
- 35 On the sources of monopolistic competitions (even without trade unions) and its implication for the employment relation: WILLIAMSON 1975. The Gini-coefficient of the wage distribution of Viennese municipal employees is 0.36 for 1805 as it is for 1883. Even in 1805, municipal employees could be sure to receive their wage payments regularly (this is in marked contrast to imperial employees: MAYR 1940). An important part of the 'internal'

history is the rising share of white collar workers which usually were a negligible in the beginning of the factory system. Figures for Lower Austrian textile manufactures in the 18th Century: HASSINGER 1964. For a fascinating study on the development of payscales within a firm: PIERENKEMPER 1981.

- 36 In contrast to the examples quoted by FISCHER, op.cit., I found less dispersion of wages in 18th Century manufactures than in similar 19th Century industries; e.g. at the turn of the Century (1804) the wage distribution of the Spiegelfabrik zu Neuhaus had a Gini-coefficient of only 0.175. The short run development of wage differentials from the late 1880s to 1914 seemed to have differed between countries as well as between occupations. For Germany: BRY 1967, pp. 80 pass. For the United States: LONG 1960, pp. 69 pass. POLLARD 1978 (pp. 171 pass.) reports stability of wage differentials for five major industries in Great Britain.
- 37 On evolutionary competition: STINCHCOMBE 1969; on 1883 and 1970: WAGNER 1979; for a different research strategy: WILLIAMSON 1980.

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Table 1

FACTORY PAY SCALE I:
SPINNING AND DYEING OF WORSTED YARN
(1869)

Job class	weekly wage (fl)		weekly wage (fl)	
	min	max	min	max
	Men older than 17 years		14 - 17 years	
1	9.00	10.80		
2	7.50	9.00	2.75	3.50
3	6.20			
4	5.00	8.00		
5	5.00	6.00	2.28	2.70
6	4.50	5.00	2.40	2.70
7	4.20	5.40		
8	4.20	4.80		
9	4.20			
10	2.70	3.30	2.52	2.70
Women older than 17 years			14 - 17 years	
11	4.00	5.00	2.75	3.50
12	4.00	5.00	2.75	3.50
13			3.00	3.60
14	2.88	3.30		
15	2.70	3.30	2.52	2.70
16			2.28	2.70
17			2.10	2.70

Working hours a day: 13

Working days a year: 303

Payment system: time rate, piece rate

Location: Vöslau (near Vienna)

Total numbers of labourers: 604 (Male 275; Female 329)

Source: Niederösterreichische Handels- und Gewerbekammer, Die Arbeits- und Lohnverhältnisse in den Fabriken und Gewerben Niederösterreichs (Wien: Sommer, 1870) pp.100-102.

Table 2

FACTORY PAY SCALE II:
MECHANICAL ENGINEERING
(1869)

Job class	Average weekly wage (fl)
1	15.40
2	12.91
3	12.85
4	12.46
5	12.45
6	11.72
7	11.65
8	11.17
9	10.32
10	9.41
11	8.67
12	6.87
Total	11.33

Skilled labourers: classes 1-8.

Semiskilled labourers: classes 9 - 11.

Unskilled labourers: class 12.

Payment system: piece rate; only class 12: time rate.

Working hours a day: 10,5.

Working days a year: 300.

Location: Vienna.

Source: Niederösterreichische Handels- und Gewerbekammer, Die Arbeits- und Lohnverhältnisse in den Fabriken und Gewerben Niederösterreichs (Wien: Sommer, 1870), p. 8.

Table 3

FACTORY PAY SCALE III:
PRODUCTION OF CARTRIDGE CASES
(1869)

Number of labourers	Job class	Weekly wage (average) fl
12	1	18
	2	15
	3	13
28	4	5-6

Skilled labourers: classes 1 - 3.

Unskilled labourers: class 4.

Working hours a day: 10,5.

Location: Vienna.

Source: Niederösterreichische Handels- und Gewerbekammer, Die Arbeits- und Lohnverhältnisse in den Fabriken und Gewerben Niederösterreichs (Wien: Sommer, 1870), p. 39.

Table 4

FACTORY PAY SCALE IV:
METAL FURNITURE
(1869)

Number of labourers	Job class	Weekly wage (fl)	
		min.	max.
2	1	18	32
90	2	10	22
62	3	10	15
23	4	10	12
8	5	10	
27	6	7	10
10	7	4	6

Skilled labourers: classes 1 - 4.

Semiskilled labourers: class 5.

Unskilled labourers: class 6.

Apprentices: class 7.

Payment system: piece rate; only for classes 5 and 6: time rate.

Working hours a day: summer 11,5.

winter 9,5.

Location: Vienna.

Source: Niederösterreichische Handels- und Gewerbekammer, Die Arbeits- und Lohnverhältnisse in den Fabriken und Gewerben Niederösterreichs (Wien: Sommer, 1870), p. 30.

Table 5

CONTEMPORARY COST OF LIVING ESTIMATES (VIENNA 1869)

Standard A: Single worker

Food (per day)

54 kr	Construction (Bricklayers)
up to	
1,20 fl	Mechanical engineering

Clothing (per year)

45,60 fl	Silk industries
up to	
136,00 fl	Construction (Painting)

Lodging (per year)

36,50 fl	Construction
up to	
54,00 fl	Clothing industries

Standard B: Family of 4 persons

Food (per day)

1,00 fl	Construction
up to	
2,10 fl	Cotton industries

Clothing (per year)

60,00 fl	Cotton industries
up to	
140,00 fl	Construction

Lodging (per year)

80,00 fl	Silk industries
up to	
110,00 fl	Cotton industries

Source: Niederösterreichische Handels- und Gewerbekammer, Die Arbeits- und Lohnverhältnisse in den Fabriken und Gewerben Niederösterreichs (Wien: Sommer, 1870). The following page numbers refer to the quoted figures in descending order: 187, 9, 122, 198, 187, 145, 189, 126, 126, 189, 123, 126.

Table 6

SIZE DISTRIBUTION OF WAGES
(Vienna and Lower Austria, 1885)

10 per cent groups of workers	F a c t o r i e s ¹⁾		C r a f t s h o p s ²⁾	
	Share of total income	Mean income of group	Share of total income	Mean income of group
top	20,1 %	15,9 fl	19,9%	17,1 fl
9th	15,3 %	12,1 fl	15,4%	13,2 fl
8th	13,2 %	10,4 fl	12,5%	10,7 fl
7th	11,6 %	9,1 fl	12,2%	10,5 fl
6th	10,2 %	8,0 fl	10,7%	9,1 fl
5th	8,8 %	6,9 fl	8,6%	7,4 fl
4th	7,5 %	5,9 fl	7,0%	6,0 fl
3rd	6,3 %	5,0 fl	5,9%	5,1 fl
2nd	4,8 %	3,8 fl	4,7%	4,0 fl
bottom	2,4 %	1,9 fl	3,1%	2,6 fl

1) The wage data on factories are based on the 1885 census which covered about 50% of the industrial work force (with adequate representation of female workers in the sample).

2) Vienna only.

Source: Handels- und Gewerbekammer. Statistischer Bericht über Industrie und Gewerbe des Erzherzogtums Österreich unter der Enns (Wien: n p, 1889); pp. 96, 173, 208, 251, 288, 379, 430, 471, 545, 603, 645; LVIII.

Table 7

SUMMARY MEASURES OF WAGE DISPERSION 1885

	Average wage	Gini- coefficient	Theil- coefficient
Factories ¹⁾	7,9fl	0,285	0,128
Craftshops	8,6fl	0,281	0,122
Factories ¹⁾			
Male	9,1fl	0,237	0,091
Female	4,4fl	0,249	0,093
Craftshops ²⁾			
1. Sex			
Male	11,1fl	0,182	0,050
Female	4,7fl	0,209	0,055
2. Efficiency level of workers			
low	6,0fl	0,257	0,103
average	8,2fl	0,247	0,092
high	10,1fl	0,275	0,116

1) Vienna and Lower Austria; 1885.

2) Vienna only; 1885.

Source: Handels- und Gewerbekammer. Statistischer Bericht über Industrie und Gewerbe des Erzherzogtums Österreich unter der Enns (Wien: n p, 1889); Factories: pp. 96, 173, 208, 251, 288, 379, 430, 471, 545, 603, 645, 683; Craftshops: p.LVIII.

Table 8

SIZE DISTRIBUTION OF FACTORY WAGES
(Vienna and Lower Austria, 1885)

Ten percent groups of workers	M a l e		F e m a l e	
	Share of total income	Mean income	Share of total income	Mean income
top	18,3%	16,7 fl	18,5%	8,2 fl
9th	14,2%	13,0 fl	14,4%	6,4 fl
8th	12,5%	11,4 fl	12,6%	5,6 fl
7th	11,3%	10,2 fl	11,5%	5,1 fl
6th	10,2%	9,3 fl	10,6%	4,7 fl
5th	9,2%	8,4 fl	9,5%	4,2 fl
4th	8,2%	7,5 fl	8,3%	3,7 fl
3rd	7,1%	6,5 fl	7,0%	3,1 fl
2nd	5,8%	5,3 fl	4,3%	1,9 fl
bottom	3,1%	2,8 fl	3,4%	1,5 fl

Source: Handels- und Gewerbekammer. Statistischer Bericht über Industrie und Gewerbe des Erzherzogtums Österreich unter der Enns (Wien: n.p., 1889); pp. 96, 173, 208, 251, 288, 379, 430, 471, 545, 603, 645, 683.

Table 9

SUMMARY MEASURES OF WAGE DISPERSION
AMONG FACTORY LABOURERS BY INDUSTRY
(Vienna, Lower Austria, 1885)

Industry	average wage	Gini-coefficient	Theil-coefficient
1	8,2 fl	0,276	0,122
2	10,3 fl		0,064
3	6,1 fl	0,313	0,161
4	8,3 fl	0,248	0,100
5	8,5 fl	0,230	0,097
6	5,8 fl	0,282	0,123
7	8,5 fl	0,252	0,097
8	6,3 fl	0,267	0,113
9	7,8 fl	0,249	0,100
10	8,6 fl	0,246	0,095
11	8,3 fl	0,203	0,066
12	10,0 fl	0,319	0,166

Key to industries:

1. Metal manufacturing.
2. Metal goods, engineering and vehicles industries.
3. Manufacture of non metallic mineral products.
4. Timber in wooden furniture industry; processing of rubber.
5. Manufacture in leather goods.
6. Textile industry.
7. Footwear and clothing industry.
8. Manufacture of paper and paper products.
9. Food and drink manufacturing industry.
10. Chemical industry.
11. Construction.
12. Printing and publishing.

Source: Handels- und Gewerbekammer. Statistischer Bericht über Industrie und Gewerbe des Erzherzogtums Österreich unter der Enns (Wien: n p, 1889); pp. 96, 173, 208, 251, 288, 379, 430, 471, 545, 603, 645, 683.

Table 10

SIZE DISTRIBUTION OF EARNINGS
IN INDUSTRY AND PUBLIC ADMINISTRATION
(1883/85)

Ten percent groups of employees	Factory workers ¹⁾		Public Employees ²⁾	
	share of total income	decil ³⁾	share of total income	decil ³⁾
top	20,1%	13,4 fl	24,7%	35,0 fl
9	15,3%	11,2 fl	15,5%	27,5 fl
8	13,2%	9,8 fl	13,2%	20,0 fl
7	11,6%	8,6 fl	10,9%	16,3 fl
6	10,2%	7,5 fl	9,1%	14,0 fl
5	8,8%	6,4 fl	7,8%	11,5 fl
4	7,5%	5,4 fl	6,5%	10,5 fl
3	6,3%	4,3 fl	5,5%	8,4 fl
2	4,8%	3,3 fl	4,3%	7,0 fl
bottom	2,4%		1,9%	

1) Vienna and Lower Austria 1885; workers only.

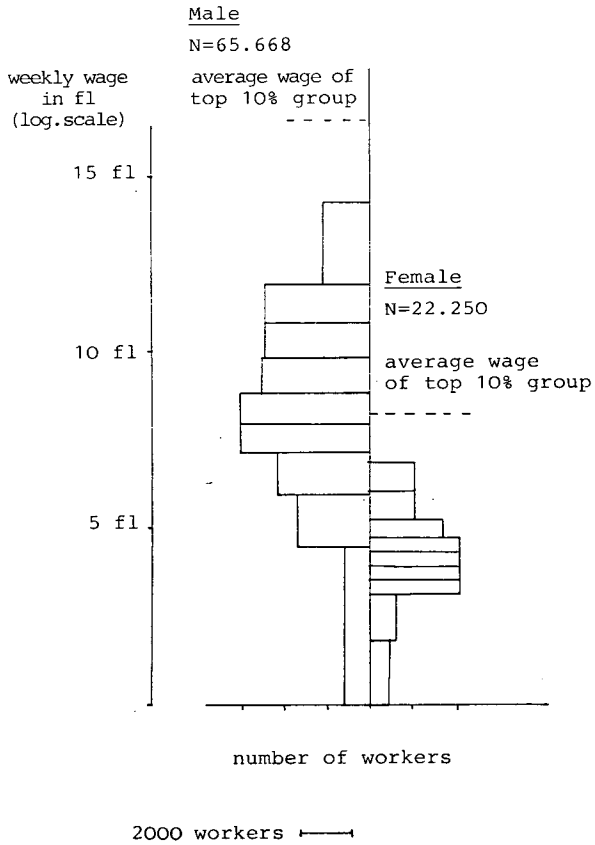
2) Vienna 1883; administrative personnel and labourers.

3) Converted to weekly earnings.

Source: Table 8 ; Statistisches Jahrbuch der Stadt Wien
1883, pp.79-84.

Chart 1

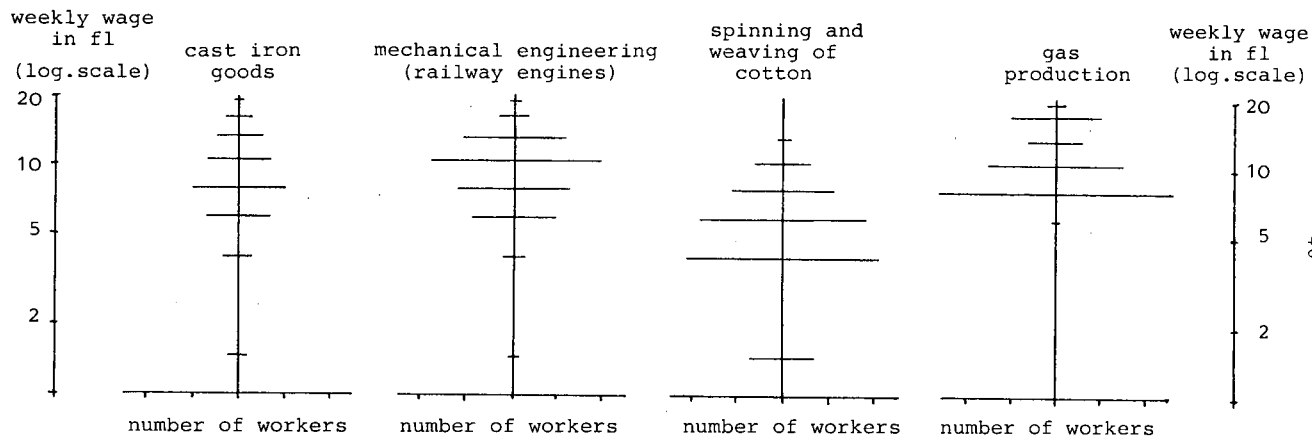
WAGE HIERARCHIES OF MALE AND FEMALE
FACTORY WORKERS
(Vienna, Lower Austria, 1885)



Source: Table 8

Chart 2

WAGE STRUCTURES IN FOUR INDUSTRIES
(Vienna and Lower Austria, 1885)

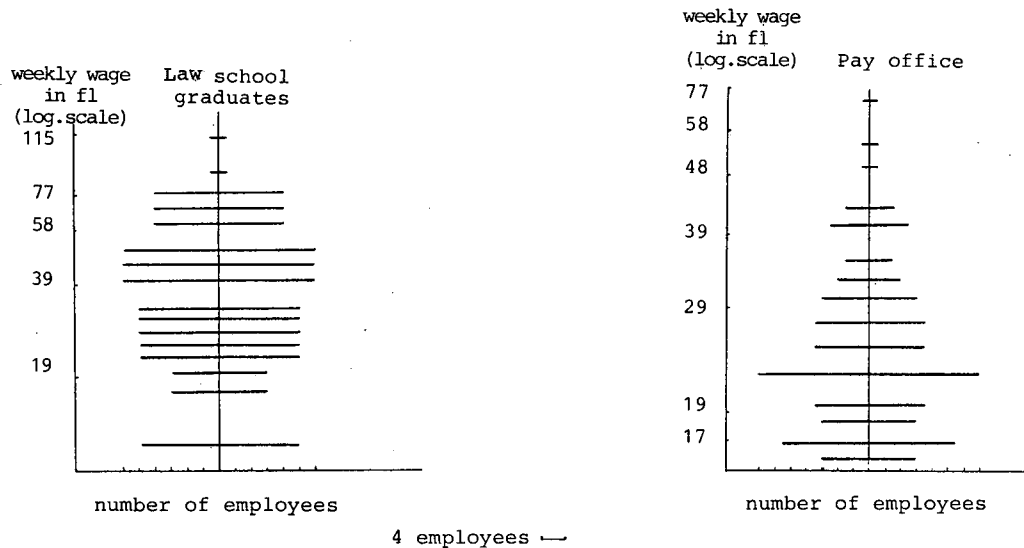


200 workers ———

Source: Handels- und Gewerbekammer. Statistischer Bericht über Industrie und Gewerbe des Erzherzogtums Österreich unter der Enns (Wien: n p, 1889); pp. 96,173,378,603.

Chart 3

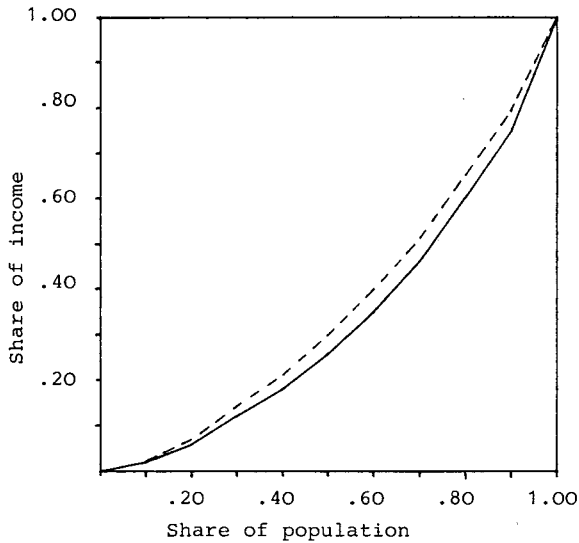
WAGE STRUCTURES OF TWO GROUPS OF TOWNHALL EMPLOYEES
(Vienna, 1883)



Source: Statistisches Jahrbuch der Stadt Wien, 1883.

Chart 4

LORENZCURVES FOR FACTORY WORKERS
AND PUBLIC EMPLOYEES
(1883/85)



----- Factory workers, Vienna and Lower Austria,
1885.

—— Public Employees, Vienna, 1883.

Source: Table 10.